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Notice of Allowability

Application No.

10/779,516

Examiner

Allen C. Ho

Applicant(s)

DINGER ET AL.

Art Unit

2882

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to application filed on 13 February 2004.
2. ☒ The allowed claim(s) is/are 16-39 and 43-46.
3. ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
 - a) ☐ All b) ☐ Some* c) ☒ None of the:
 1. ☒ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

* Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.

THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

4. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.
5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
 - (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
 - 1) ☐ hereto or 2) ☐ to Paper No./Mail Date _____.
 - (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.

Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☒ Notice of References Cited (PTO-892)
2. ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3. ☒ Information Disclosure Statements (PTO-1449 or PTO/SB/08),
Paper No./Mail Date 14062004, 12092005
4. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material
5. ☐ Notice of Informal Patent Application (PTO-152)
6. ☐ Interview Summary (PTO-413),
Paper No./Mail Date _____.
7. ☒ Examiner's Amendment/Comment
8. ☒ Examiner's Statement of Reasons for Allowance
9. ☐ Other _____.

88

DETAILED ACTION

Election/Restrictions

1. Restriction to one of the following inventions is required under 35 U.S.C. 121:
 - I. Claims 16-39 and 43-46, drawn to a substrate material for an optical component for x-rays of wavelength λ_R , classified in class 378, subclass 34.
 - II. Claims 40-42, drawn to a method for producing a substrate material for an optical component for x-rays of wavelength λ_R , classified in class 451, subclass 41.

The inventions are distinct, each from the other because of the following reasons:

2. Inventions I and II are related as product made and process of making. The inventions are distinct if either or both of the following can be shown: (1) that the process as claimed can be used to make other and materially different product or (2) that the product as claimed can be made by another and materially different process (MPEP § 806.05(f)). In the instant case the process as claimed could be applied to other materials and/or product.
3. During a telephone conversation with John Yankovich (Reg. No. 42,240) on 13 September 2005 a provisional election was made without traverse to prosecute the invention of I, claims 16-39 and 43-46. Affirmation of this election must be made by applicant in replying to this Office action. Claims 40-42 are withdrawn from further consideration by the examiner, 37 CFR 1.142(b), as being drawn to a non-elected invention.
4. Applicant is reminded that upon the cancellation of claims to a non-elected invention, the inventorship must be amended in compliance with 37 CFR 1.48(b) if one or more of the currently named inventors is no longer an inventor of at least one claim remaining in the

Art Unit: 2882

application. Any amendment of inventorship must be accompanied by a request under 37 CFR 1.48(b) and by the fee required under 37 CFR 1.17(i).

EXAMINER'S AMENDMENT

5. An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee.

Authorization for this examiner's amendment was given in a telephone interview with John Yankovich (Reg. No. 42,240) on 21 September 2005.

The application has been amended as follows:

- (1) Page 3, line 14, "1 mm to 1 μ m" has been replaced by --1 μ m to 1 mm--.
- (2) Page 3, line 15, "1 μ m to 10 nm" has been replaced by --10 nm to 1 μ m--.
- (3) Page 4, line 21, "HSRF" has been replaced by --HSFR--.
- (4) Claims 40-42 have been canceled.

Allowable Subject Matter

6. Claims 16-39 and 43-46 are allowed.

7. The following is an examiner's statement of reasons for allowance:

With regard to claims 16-33, although the prior art discloses a substrate material for an optical component for x-rays of wavelength λ_R comprising a glass phase made of amorphous material having a positive coefficient of thermal expansion, and a crystal phase including

microcrystallites having a negative coefficient of thermal expansion, wherein the substrate material has a stoichiometric ratio of the crystal phase to the glass phase such that a coefficient of thermal expansion of the substrate material is less than about $5 \times 10^{-6} \text{ K}^{-1}$ in a temperature range of about 20°C to 100°C , it fails to teach or fairly suggest that the microcrystallites have a means size of less than about $4\lambda_R$ and the substrate material has a high spatial frequency roughness (HSFR) of less than $\lambda_R/30$ rms as claimed.

With regard to claims 34-36, although the prior art discloses a substrate material for an optical component for x-rays of wavelength $10 \text{ nm} \leq \lambda_R \leq 30 \text{ nm}$ comprising a glass phase made of amorphous material having a positive coefficient of thermal expansion, and a crystal phase including microcrystallites having a negative coefficient of thermal expansion, wherein the substrate material has a stoichiometric ratio of the crystal phase to the glass phase such that a coefficient of thermal expansion of the substrate material is less than about $5 \times 10^{-6} \text{ K}^{-1}$ in a temperature range of about 20°C to 100°C , it fails to teach or fairly suggest that the microcrystallites have a means size of less than about 38 nm and the substrate material has a high spatial frequency roughness (HSFR) of less than $\lambda_R/30$ rms as claimed.

With regard to claims 37-39, although the prior art discloses an optical component for x-rays of wavelength λ_R comprising a glass phase made of amorphous material having a positive coefficient of thermal expansion, and a crystal phase including microcrystallites having a negative coefficient of thermal expansion, wherein the substrate material has a stoichiometric ratio of the crystal phase to the glass phase such that a coefficient of thermal expansion of the substrate material is less than about $5 \times 10^{-6} \text{ K}^{-1}$ in a temperature range of about 20°C to 100°C , it fails to teach or fairly suggest that the microcrystallites have a means size of less than about

$4\lambda_R$ and the substrate material has a high spatial frequency roughness (HSFR) of less than $\lambda_R/30$ rms as claimed.

With regard to claim 43, although the prior art discloses an EUV projection system comprising a illumination system for illuminating a mask, a projection lens system for projecting an image of the mask, wherein at least one of the illumination system or the projection lens system includes an optical component for x-rays of wavelength λ_R having a substrate material that includes (a) a glass phase made of amorphous material having a positive coefficient of thermal expansion, and (b) a crystal phase including microcrystallites, wherein the substrate material has a high spatial frequency roughness (HSFR) of less than about $\lambda_R/30$ rms, it fails to teach or fairly suggest that the microcrystallites have a negative coefficient of thermal expansion and a means size of less than about $4\lambda_R$, and the substrate material has a stoichiometric ratio of the crystal phase to the glass phase such that a coefficient of thermal expansion of the substrate material is less than about $5 \times 10^{-6} \text{ K}^{-1}$ in a temperature range of about 20°C to 100°C as claimed.

With regard to claim 44, although the prior art discloses an x-ray system comprising a substrate material that includes a glass phase made of amorphous material having a positive coefficient of thermal expansion, and a crystal phase including microcrystallites, wherein the substrate material has a high spatial frequency roughness (HSFR) of less than about $\lambda_R/30$ rms, it fails to teach or fairly suggest that the microcrystallites have a negative coefficient of thermal expansion and a means size of less than about $4\lambda_R$, and the substrate material has a stoichiometric ratio of the crystal phase to the glass phase such that a coefficient of thermal expansion of the substrate material is less than about $5 \times 10^{-6} \text{ K}^{-1}$ in a temperature range of about 20°C to 100°C as claimed.

With regard to claims 45 and 46, although the prior art discloses a substrate material for an optical component for x-rays of wavelength $10 \text{ nm} \leq \lambda_R \leq 30 \text{ nm}$ comprising an amorphous material having a positive coefficient of thermal expansion, and crystallites having a negative coefficient of thermal expansion, wherein the substrate material has a coefficient of thermal expansion of the substrate material is less than about $5 \times 10^{-6} \text{ K}^{-1}$ in a temperature range of about 20°C to 100°C , it fails to teach or fairly suggest that the crystallites have a means size of less than about 38 nm and the substrate material has a high spatial frequency roughness (HSFR) of less than $\lambda_R/30$ rms as claimed.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Conclusion

8. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure:

- (1) Davis, Jr. *et al.* (U. S. Patent No. 6,931,097 B1) disclosed an extreme ultraviolet soft x-ray projection lithography system comprising an optical component, the optical component comprises a substrate material having a glass phase (SiO_2), a crystal phase (TiO_2), and the optical component has a high spatial frequency roughness (HSFR) of less than $\lambda_R/30$ rms (Given that $\lambda_R = 5 - 15 \text{ nm}$, the substrate material has an HSFR less than 0.10 nm rms; column 6, lines 37 - 54).

- (2) Goto (U. S. Pub. No. 2005/0065011) disclosed a substrate material comprising a glass phase made of amorphous material and a crystal phase including microcrystallites having a negative coefficient of thermal expansion [0047].
- (3) Weiser *et al.* (U. S. Pub. No. 2004/0174624 A1) disclosed a substrate material having a glass phase and a crystal phase [0032], and the substrate material has a high spatial frequency roughness (HSFR) of less than $\lambda_R/30$ rms [0027].
- (4) Aschke *et al.* (U. S. Pub. No. 2004/0166420 A1) disclosed a substrate material comprising a glass phase made of amorphous material and a crystal phase including microcrystallites having a negative coefficient of thermal expansion [0028], the substrate material has a stoichiometric ratio of the crystal phase to the glass phase such that a coefficient of thermal expansion of the substrate material is less than about $5 \times 10^{-6} \text{ K}^{-1}$ in a temperature range of about 20°C to 100°C [0023], and the substrate material has a high spatial frequency roughness (HSFR) of less than $\lambda_R/30$ rms [0045].
- (5) Davis, Jr. *et al.* (U. S. Patent No. 6,465,272 B1) disclosed disclosed an extreme ultraviolet soft x-ray projection lithography system comprising an optical component, the optical component comprises a substrate material having a glass phase (SiO_2), a crystal phase (TiO_2), and the optical component has a high spatial frequency roughness (HSFR) of less than $\lambda_R/30$ rms (Given that $\lambda_R = 5 - 15 \text{ nm}$, the substrate material has an HSFR less than 0.15 nm rms; column 4, lines 33 - 55).

Art Unit: 2882

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Allen C. Ho whose telephone number is (571) 272-2491. The examiner can normally be reached on Monday - Friday from 8:00 am - 5:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Edward J. Glick can be reached at (571) 272-2490. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Allen C. Ho
Primary Examiner
Art Unit 2882

21 September 2005